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## Biography

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Patrick Soukiassian is Professor of Physics (Exceptionnal Class) at the University of Paris-Sud/Orsay since 1988 and Head of the SIMA research group at CEA/Saclay (Atomic Energy Commission) France. He is been elected Member of the National Academy of Sciences of Armenia. Previously, he was Professor at the University of Wisconsin-Madison and at the Northern Illinois University in the U.S.A., and associate Professor at the University of Reims-Champagne-Ardennes in France. He is also the President of the STAR (Science, Advanced Technology and Research) non-profit organization and serves as Editorial Board Member on Journal of Physics D: Applied Physics, Surface Review and Letters and e-Journal of Surface Science and Nanotechnology. He has organized several international conferences and schools. His research interests focus on the atomic structure, properties, catalysis and nanochemistry of semiconductor and metal surfaces, interfaces and nano-objects, in particular those of silicon carbide, using near-field scanning probe microscopy/spectroscopy and synchrotron radiation-based techniques. This research has led to the discovery of novel surface/interface properties, and nano-objects with unprecedented characteristics. Patrick Soukiassian is the 2007 Laureate of the Semiconductor Surfaces, Interfaces and Nanostructures Prize (SSIN-2007) for « *His Pioneering and Seminal Contributions to the Field, and Particularly his Work Exploring Silicon Carbide* ».

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## Semiconductor and Nanoscience: Where Are We Coming From, Where Are We, Where Are We Heading ?

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Technological development is driving condensed matter physics towards smaller objects having low dimensionality (2D, 1D, 0D). This is of strong fundamental interest since these nano-objects may have very different properties compared to the macroscopic scale. They could potentially be very useful in technology, e.g. in electronics where integration density has to double every 18 months (Moore's law). However, such a "top to bottom" approach will, within less than a decade, reach fundamental limits. Therefore, a "bottom-up" approach has to be also considered. This includes the implementation of self-organized mechanisms to fabricate nanostructures (quantum dots, nanowires and other nano-objects) and control their properties at sub-nanometric scales. It requires not only new materials but also the atomic scale control and understanding of their surfaces and interfaces, using state-of-the-art experimental tools and theory. While the first transistor was based on germanium (John Bardeen, Physics Nobel Prize), the development of electronics made silicon the material of the 20<sup>th</sup> century. What could be the material of the 21<sup>th</sup> century ? Do we need more "Moore", or more than "Moore" ?

Few interesting aspects about some elemental and compound semiconductor surfaces and interfaces will be presented and discussed. These include i) fabrication of 0D, 1D and 2D nano-objects by manipulation and/or self-organized approaches, and ii) monitoring the surface/interface by a selective nanochemistry leading to important functions as passivation and/or metallization. These studies are based on advanced experimental techniques (STM, STS, synchrotron radiation-based photoelectron spectroscopy), and state-of-the-art *ab-initio* total energy calculations. The results impact the development of nano-objects leading to massively parallel passive/active architectures, and the engineering of surface/nano-object properties, including methods to make electrical contacts on wide band-gap chemically passive materials particularly exciting for interfacing with biological systems.